

REMARKS

In response to the Final Office Action mailed February 3, 2003, Applicant respectfully requests reconsideration. To further the prosecution of this application, amendments have been made to the claims, and the claims as presented are believed to be in allowable condition.

Claims 1-11 are pending in this application. Claims 1, 2, 3, 6, 7, and 8 have been amended herein.

Telephone Interview With Examiner Thomson

On April 24, 2003, the undersigned contacted Examiner Thomson to discuss the above-identified application. Details of this telephone interview are summarized below.

During the telephone interview, the rejection of claims 1-11 under 35 U.S.C. §112, first paragraph, was discussed. Specifically, the undersigned requested the Examiner to clarify whether the claims were rejected under the “enablement” requirement of 35 U.S.C. §112, first paragraph, the “written description” requirement of 35 U.S.C. §112, first paragraph, or both. Examiner Thomson indicated that although the rejection of claims 1-11 was primarily based upon the enablement requirement, they had also been rejected under the written description requirement, and requested that any response to the Office Action address both provisions of 35 U.S.C. §112, first paragraph.

The undersigned also requested clarification of the objection to the drawings made in paragraph 4 of the Office Action. In response, Examiner Thomson indicated that he believed a figure (such as a flow chart) illustrating how variables are arranged was necessary to overcome this objection.

Examiner Thomson expressed confusion with respect to the passage at page 7, line 30 to page 8, line 4 in Applicant’s substitute specification relating to how the processor 40 “consults a function graph by arranging the variables...” Indeed, this confusion is also apparent in the Office Action at page 3. Based upon a review of this application, it appears that the term “consults” is simply a typographical error, and that this word should have been “constructs.” Accordingly, the specification has been amended to reflect this change. As the basis for this change is believed to be apparent upon a review of the specification as a whole, no new matter is believed to have been added.

During the telephone interview, the undersigned explained that embodiments of the present invention are broadly directed to a method and apparatus for ordering variables in a binary decision diagram representation of a hardware system in a static ordering step that is performed prior to performing a sifting of the variables (i.e., a dynamic ordering step). As such, the undersigned explained that the present invention is not directed nor limited to a specific type of sifting, as any of a number of different sifting algorithms known in the art could be used therewith. Examiner Thomson appeared to understand this aspect of the invention, and while no substantive agreement was reached regarding the patentability of the claims, he indicated that he would fully consider Applicant's response.

Drawing Objections

In paragraph 4, the Office Action objected to the drawings under 35 C.F.R. §1.83a as failing to show every feature of the invention specified in the claims. The Office Action asserts that the figures fail to show a processor adapted to arrange, or how the arranging is performed. This objection is respectfully traversed.

In Fig. 7, a processor 40 is illustrated that may be programmed to arrange variables of a binary decision diagram in the manner recited in the claims. In Fig. 8, the acts by which this arranging is accomplished are illustrated. As described at page 8, lines 17-19 of Applicant's substitute specification and illustrated in act 1008, the processor 40 arranges the variables of the binary decision diagram on the nodes of a graph whereby the nodes are labeled by the variables. An example of such a graph is illustrated in Fig. 6 for the multiplexer of Fig. 2. As illustrated in Fig. 6, and described at page 8, lines 1-4 of Applicant's substitute specification, the variables are arranged in a representation of the nodes of the graph, such that the nodes are labeled with the variables so that the set of function labeling leaves reachable from a node corresponds to the set of functions which depend on the variables labeling the node. The processor then traverses the graph in a depth-first manner, as shown in Fig. 6 by the arrow and described at page 8, lines 4-6 and illustrated in act 1010 of Fig. 8 and described at page 8, lines 19-20, to produce a list of the labels in a selected order.

Accordingly, as Fig. 8 does illustrate an act of arranging variables, and as Fig. 6 illustrates a representation of how the variables are arranged, Applicant respectfully requests that the objection to the drawings in paragraph 4 of the Office Action be withdrawn.

Rejections Under 35 U.S.C. §112, first paragraph

Claims 1-11 stand finally rejected under 35 U.S.C. §112, first paragraph, as failing to comply with both enablement requirement and the written description requirement of this provision of the statute. This rejection is respectfully traversed.

Preliminarily, Applicant's invention is not directed to a particular manner of sifting variables of a binary decision diagram representation of a hardware system, but rather to a method and apparatus for ordering variables of a binary decision diagram representation of a hardware system prior to sifting the variables, and which may be used in combination with any one of a variety of known sifting techniques. Further, Applicant respectfully points out that a particular manner of sifting (i.e., that of sifting variables one by one in the selected order to a deepest best location and then sifting the variables one by one in the reverse of the selected order to a shallowest best location) according to a selected order determined in a pre-sifting ordering step is, in fact, described in Applicant's replacement specification at page 3, lines 5-8, page 8, lines 22-23, and in claim 5 as originally filed.

A. Written Description

The purpose of the Written Description requirement is to evidence that the inventor had possession of the claimed invention. (See MPEP §2163, Section I, page 2100-159, Rev. 1, Feb. 2003 "To satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention.) Further, "[w]hat is conventional or well known to one of ordinary skill in the art need not be disclosed in detail." (MPEP §2163, Section II.A.3(a), page 2100-166.) With respect to original claims, "[t]here is a strong presumption that an adequate written description of the claimed invention is present in the specification as filed, . . . [c]onsequently, rejection of an original claim for lack of written description should be rare." MPEP §2163, Section II.A., page 2100-163.

From the Office Action, it is apparent that the Examiner believes that the written description requirement of 35 U.S.C. §112, first paragraph, has been satisfied, as the Examiner states, "Examiner accepts that Applicant has something that performs a 'sifting,' 'adapting,' or 'arranging' step/means in their end product." Applicant now specifically points out where support for the subject matter of the claims may be found.

Fig. 5 shows a binary decision diagram for the multiplexer illustrated in Fig. 2, and Fig. 6 illustrates a function graph for that same multiplexer. As illustrated in Fig. 6, and described at page 7, lines 1-8 and page 8, lines 1-4 of Applicant's substitute specification, to set up the graph, the variables of the binary decision diagram of Fig. 5 are arranged in a representation of the nodes of the graph (Fig. 6), such that the nodes are labeled with the variables so that the set of function labeling leaves reachable from a node corresponds to the set of functions which depend on the variables labeling the node. The method of using the function graph is then described at page 7, lines 9-15 and page 8, lines 4-6 of Applicant's substitute specification. As described therein, the function graph is traverse in a depth-first manner, as indicated by the arrow in Fig. 6, such that no node is visited before all of its predecessors has been visited, but each node is visited as soon as all its predecessors have been visited (unless there is a race between more than one node, in which case one of the competing nodes is chosen and its subgraphs traversed first.) At page 7, lines 16-25, the selected order obtained by traversing the function graph of Fig. 6 in a depth-first manner is described, which is then used to sift the variables and restructure the binary decision diagram. Although not limited to a particular manner of sifting the variables of a binary decision diagram, one preferred method of doing so is then described at page 8, lines 22-23, wherein the variables are sifted one-by-one in the selected order to a deepest best location and then sifted, one-by-one in the reverse of the selected order to a shallowest best location.

Given the above-described support for the subject matter recited in the original and now pending claims, and the fact that the present application is directed to a mature and predictable technology wherein the knowledge and skill in the art is high (as evidenced by the Aho reference as well as the other art cited in this application), Applicant respectfully requests the rejection of claims 1-11 under the written description requirement of 35 U.S.C. §112, first paragraph, be withdrawn.

B. Enablement

As noted in the MPEP, [t]he test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. A patent need not teach, and preferably omits, what is well known in the art.” (MPEP §2164.01, page 2100-179.) Further, [t]he amount of guidance or direction needed to enable the invention is inversely related to the amount of knowledge in the state of the art as well as the predictability in the art.” MPEP §2164.03, page 2100-182.

The present application satisfies the requirements of the enablement requirement under 35 U.S.C. §112, first paragraph. Specifically, as detailed above, the specification contains clear textual support for the subject matter being claimed, as the manner in which variables of a binary decision diagram are arranged in a function graph, and the manner in which that graph is traversed to determine a selected order in which the variables may be sifted are described. With respect to the manner in which variables may be sifted, a preferred manner of sifting is described at page 8, lines 22-23 of Applicant’s replacement specification, although other types of sifting known in the art may alternatively be used. Given that one preferred manner of sifting has been described, the maturity and predictability of the technology to which the present application is directed, the knowledge and level of skill in the art to which this application pertains, and the literal description in this application of how the variables of a binary decision diagram are arranged in a function graph, and how that graph is traversed to determine a selected order in which the variables may be sifted, Applicant believes the specification is clearly enabling to one of ordinary skill in the art to which it pertains without undue experimentation. Accordingly, it is respectfully requested that the rejection of claims 1-11 under the enablement requirement of 35 U.S.C. §112, first paragraph, be withdrawn.

Rejections Under 35 U.S.C. §102(b) Over Aho

In paragraphs 8 and 9 of the Office Action, claims 1-11 were rejected under 35 U.S.C. §102(b) as being anticipated by Aho et al. in its entirety. The Office Action asserted that Aho

explicitly teaches all the limitations of the claims, referring specifically to sections 4.4, 4.5, and 10.9. This rejection is respectfully traversed.

First, each of the independent claims of this application have been amended to clarify that the present invention is directed to methods and apparatus for ordering variables of a binary decision diagram representation of a hardware system in a selected order prior to sifting the variables. This ordering may be done alone or in combination with a sifting of the variables to restructure the binary decision diagram representation. This aspect of Applicant's invention is not disclosed, taught, or suggested in Aho. Specifically, in Aho, the variables are sifted as the graph is traversed; there are no acts of traversing the representation of the graph from the top down to produce a list of labels in a selected order and using the selected order of the list to determine a sifting order in which the variables are sifted prior to sifting the variables as recited in claim 1.

Nor does Aho disclose, teach, or suggest the method of restructuring a binary decision diagram representative of a hardware system as recited in claim 3. The method of claim 3 clearly recites acts of traversing the representation of the graph from the top down to produce a list of the labels in a selected order, and sifting the variables based on the selected order. Clearly, the fact that the variables are sifted in "the selected order" requires that the selected order be determined prior to the act of sifting. This is contrast to Aho in which variables are sifted as the graph is traversed. As such, claim 3 is believed to patentably distinguish over Aho.

Independent method claim 7 is believed to patentably distinguish over Aho for similar reasons to those mentioned above with respect to claim 3.

With respect to independent apparatus claims 2, 6, and 8, Aho fails to disclose any particular type of circuitry for performing that which is asserted, and as such, cannot anticipate these claims.

Dependent claims 4, 5, and 9-11 depend from one of claims 3 or 8 and patentably distinguish over Aho for at least the same reasons.

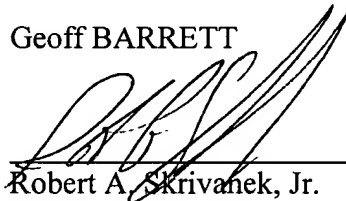
CONCLUSION

In view of the foregoing amendments and remarks, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes after this Amendment that the application is not in condition for allowance, the Examiner is requested to call Applicants' attorney at the number listed below to discuss any outstanding issues relating to allowability.

If this response is not considered timely filed, and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by the enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,

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